

Application No. 10/749,984  
Response to Office Action

Customer No. 01933

**Amendments to the Drawings:**

Fig. 2 has been amended to add a lead line from the left-hand occurrence of reference 5c.

Attachment:     Annotated Sheet Showing Changes  
                  Replacement Sheet

### **R E M A R K S**

Reconsideration of this application, as amended, is respectfully requested.

### **THE DRAWINGS**

Fig. 2 has been amended to add a lead line from the left-hand occurrence of reference 5c.

Submitted herewith are a corrected sheet of formal drawing which incorporates the amendment and an annotated sheet showing the changes made thereto.

No new matter has been added, and it is respectfully requested that the amendment to Fig. 2 be approved and entered.

### **THE CLAIMS**

Claim 1 has been amended to clarify the feature of the present invention whereby the ink jet recording apparatus comprises a filter unit, which is provided in the ink supply channel at a position higher than the ink supply port of the ink jet head, and which comprises a filter that includes a plurality through holes to filter the ink flowing through the ink supply channel. In addition, claim 1 has been amended to clarify the feature of the present invention whereby the filter is slanted in the filter unit with respect to a horizontal surface and is formed by a metal plating process to guide bubbles generated

under the filter, downstream of the filter in an ink flowing direction, to a peripheral section of the filter, and whereby the bubbles collected at the peripheral section pass upward through the filter. See, for example, claims 2 and 4, Figs. 1, 2 and 7, and the disclosure in the specification at, for example, page 9, lines 4-11, page 16, lines 2-20, and page 17, lines 13-17.

Claim 2, moreover, has been amended to better accord with amended independent claim 1, and claims 1-3 have also been amended to make some minor grammatical improvements and/or to correct some minor antecedent basis problems so as to put them in better form for issuance in a U.S. patent.

No new matter has been added, and it is respectfully requested that the amendments to claims 1-3 be approved and entered.

#### THE PRIOR ART REJECTION

Claims 1, 4, 7 and 10 were rejected under 35 USC 102 as being anticipated by USP 6,158,855 ("Saikawa"), and claims 2, 3, 5, 6, 8, 9, 11 and 12 were rejected under 35 USC 103 as being obvious in view of the combination of Saikawa and EP 0 930 169 ("Usui et al"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

According to the present invention as recited in amended independent claim 1, an ink jet recording apparatus is provided

which comprises: an ink container containing ink; an ink jet head, which includes an ink supply port communicating with the ink container via an ink supply channel, to discharge the ink from a nozzle as ink droplets; and a filter unit, which is provided in the ink supply channel at a position higher than the ink supply port of the ink jet head, and which comprises a filter that includes a plurality of through holes to filter the ink flowing through the ink supply channel. As recited in amended independent claim 1, the filter is slanted in the filter unit with respect to a horizontal surface and is formed by a metal plating process to guide bubbles generated under the filter, downstream of the filter in an ink flowing direction, to a peripheral section of the filter. And as recited in amended independent claim 1, the bubbles collected at the peripheral section pass upward through the filter.

Thus, the structure of the claimed present invention is directed to avoiding problems caused by bubble generated downstream of the filter. In particular, it is respectfully pointed out that, as explained in the Background section of the specification (see pages 4 and 5), even if bubbles flowing from the ink tank toward the nozzle are removed at the filter, bubbles are generated downstream of the filter due to temperature changes, pressure changes, or dissolved gas, and flow upstream. These bubbles flow upstream (due to buoyancy) and are trapped at

the filter. If the filter is horizontal, the bubbles form a thin bubble layer on the surface of the filter and thereby interfere with the supply of ink from the tank to the nozzle. Even if the filter is slanted, moreover, the bubbles trapped by the filter stay at the filter surface and gradually increase in number, thereby narrowing the effective area of the filter and reducing the speed of ink filtering.

With the structure of the present invention as recited in amended independent claim 1, the filter is slanted and is formed by a metal plating process to guide bubbles generated under the filter, downstream of the filter in an ink flowing direction, to a peripheral section of the filter. The bubbles collected at the peripheral section pass upward through the filter.

More specifically, as described in the specification at page 16, lines 2-9 with respect to Fig. 7, when the size of the collected bubbles reaches a predetermined size, the bubbles pass upward through the filter, due to buoyancy and especially pressure of the ink traveling through the filter toward the ink jet head.

By contrast, it is respectfully submitted that both Saikawa and Usui et al are directed to trapping bubbles formed upstream of the filter, due to changing of an ink cartridge or dissolved gas, that are traveling toward the ink jet head. See, for

example, Figs. 4-6 of Saikawa. Thus, according to Saikawa, the bubbles 251 are trapped and collected in an upper chamber of the filter box 211.

According to Usui et al, moreover, the filter and filter chamber are structured so as to capture the bubbles at the upstream side of the filter chamber and to prevent them from traveling with the ink through the filter. Thus, according to Usui et al, the bubble B1 "stagnates in the upper filter chamber 18b and sticks to the projections 20" (paragraph [0021]).

According to both Saikawa and Usui et al, the bubbles can only be removed by being sucked downstream to the ink jet head by a sucking mechanism used.

Thus, it is respectfully submitted that neither Saikawa nor Usui et al discloses, teaches or suggests a filter unit in an ink jet recording apparatus having the structure recited in amended independent claim 1, whereby the filter is slanted in the filter unit with respect to a horizontal surface and is formed by a metal plating process to guide bubbles generated under the filter, downstream of the filter in an ink flowing direction, to a peripheral section of the filter, and whereby the bubbles collected at the peripheral section pass upward through the filter.

Still further, it is respectfully submitted that the other cited references also do not disclose, teach or suggest the above

described claimed structural features and advantageous effects of the present invention as recited in amended independent claim 1.

In particular, it is noted that USP 6,398,354 merely discloses a filtering device, without mentioning a relationship between bubbles and the filtering device. In addition, it is noted that JP 2001-018414 is directed to bubbles formed upstream of the filter, which are captured by the filter, and that according to this reference a strong flow of ink is used to force the bubbles downstream to the recording head. Still further, it is noted that USP 6,953,243 discloses a filter that traps bubbles from downstream that cannot pass through the filter (column 47, lines 50-51) and that are removed by a sucking operation.

In view of the foregoing, it is respectfully submitted that the present invention as recited in amended independent claim 1 and amended claims 2, 3 and 7-9 depending therefrom clearly patentably distinguishes over Saikawa and Usui et al, taken singly or in combination, together with any of the other prior art references of record, under 35 USC 102 as well as under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

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If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

  
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Fig. 1

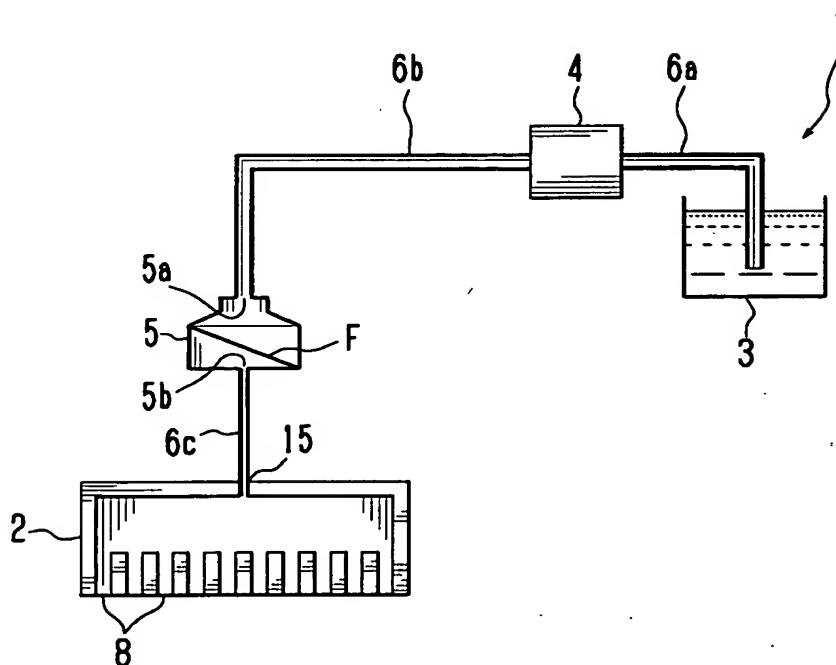


Fig. 2

